223 The Adolescent Patient

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Adolescence is a unique time of rapid physical, psychologic, sexual, social, and cognitive growth and development that distinguishes the adolescent and his or her health care needs and expectations from those of the child or adult. Although puberty cannot be precisely defined by chronologic age, the process usually has its onset and completion during the second and the early part of the third decade of life, spanning approximately 10 to 24 years of age.

To provide comprehensive health care (acute episodic, continuous, and preventive) for this age group requires the physician to have a general working knowledge of the onset, sequence, characteristics, and interrelationships of the critical features of pubertal growth and development. Perhaps more than any other period in life, an effective synthesis of each of these components is required for optimal health care resulting in "a state of complete physical, mental, and social well-being" (Deliege, 1983) rather than just the absence of disease. Equally important is for the physician to have a desire and aptitude for working with this age group.

This chapter focuses on the major elements of the pubertal process that define the unique features of the history, physical examination, laboratory evaluation, health education, and preventive medicine in the adolescent as compared to the child or the adult.

The Pubertal Process

Primary Hormone Changes

The precise trigger for the onset of puberty is not known, but much is known about the process. Current data suggest that the first chemical evidence of puberty is an increase in the production and release of dehydroepiandrosterone (DHEA) and its sulfate (DHEA-S) by the adrenals (adrenarche). The initial rise usually occurs between 7 and 9 years of age in both the male and female followed by a progressive increase to adult levels.

The next identifiable event begins 1 to 2 years after adrenarche when the hypothalamic-pituitary system begins to exhibit a diminished sensitivity to the prepubertal levels of the gonadal steroids, primarily estradiol and testosterone. This results in an increased production and release of gonadotropin releasing hormone (GnRH) by the hypothalamus. As a result of these increased levels of GnRH and an apparent increase in the pituitary's sensitivity to this peptide, there is an increase in the production and release of luteinizing (LH) and follicle stimulating hormone (FSH). At the onset, the increase in LH and FSH occurs only during non-REM sleep, but, with time progresses to a persistent increase throughout the day. These changes stimulate the growth and hormone production of the gonads, primarily testosterone, estradiol, dihydrotestosterone, and delta-4-androstenedione. These hormones steadily increase to adult levels over a period of about 3 years in the male and 4 years in the female. For those who progress most rapidly (5th percentile) and the slowest (95th percentile), the years are respectively for the male about 1.9 and 4.7 years and for the female 1.5 and 9.0 years.

During puberty the 24 hour integrated concentration of circulating growth hormone (GH) increases. Beginning at about 10 years of age, the circulating levels of insulin-like growth factor I (somatomedin C), begin to rise with a peak at about the time of the maximum increase in height and weight during puberty, that is, the year of peak height velocity (PHV) and peak weight velocity (PWV).

Thyroxine, triiodothyronine, cortisol, glucagon, insulin, and parathyroid hormone do not increase significantly, but normal levels of these hormones are an important part of the internal milieu since they serve permissive and/or facilitative roles for the primary hormones of puberty to produce normal growth and development.

Physical Growth

During puberty all body parts normally increase in size with the exception of the thymus, tonsils, and adenoids, which decrease in size. Normally, the linear growth of puberty accounts for 15 to 25% of an individual's adult height, while the growth in weight accounts for close to 50% of an "ideal" adult body weight.

The majority of this height and weight increase occurs during a 36-month period that includes the year of peak growth (i.e., PHV and PWV). During this 36-month span, the 3rd to 97th percentiles for linear growth in males are 15.4 and 28.2 cm and in females 14.2 and 26.2 cm respectively. For weight, these values are 12.3 and 30.8 kg in males and 10.3 and 26.1 kg in females. The PHV and PWV normally occurs about 18 to 24 months earlier in the female than the male.

The major contributors to the gain in weight are the lean, fat, and bone masses. The male and female increases in these components differ quantitatively and qualitatively. The most striking differences are in muscle and fat. In the pubertal male there is about a 7-fold increase in muscle mass compared to a 3- to 5-fold in the female. Peak muscle growth usually occurs within 6 to 12 months of the PHV year with the peak increase in strength coming 12 to 18 months after PHV. In the pubertal female there is a 4 to 10% increase in the percentage of total body weight as fat compared to a 5 to 7% decrease in the male.

Bone mass increases in parallel with muscle mass, and the epiphyses of the hands, wrist, and long bones progressively fuse during puberty. The hand and wrist epiphyses are usually closed in the female by age 17 years and in the male by 19 years. Once this fusion is complete, it is rare for an individual to grow more than another 3.75 cm in height.

As observed by Tanner (1962), the typical sequence of events is: lengthening of the legs, followed by a widening

of the chest and hips, then a broadening of the shoulders (males > females), followed by a lengthening of the trunk and the anterior posterior width of the thorax. Peak growth typically occurs within a 12- to 18-month span for all these parameters.

The striking facial changes during puberty are the result of an increase in the length and width of the face, particularly the mandible, which usually peaks in growth within 6 months of PHV. In addition, the nose and pharynx grow in length and the hyoid bone moves to a lower position than during childhood.

Secondary Sexual Growth

For the body-conscious teenager, the development of secondary sexual characteristics is an important and easily observed milestone in the pubertal process. For almost all males (~98%), the *first* physical evidence of beginning puberty is an enlargement of the testes and for about 80% of females the appearance of palpable breast tissue under the areola (breast budding). For the remainder, pubic hair is the first physical evidence of puberty. There is also a progressive growth of axillary hair in both sexes, and in the male the voice lowers and a beard begins with the mustache of puberty. There is about a 7-fold increase in the size of the male's testes, epididymis, and prostate and the female's uterus and ovaries. A substantial increase also occurs in the size of the areola and penis in the male and the areola, breasts, labia, clitoris, vagina, and fallopian tubes in the female.

The uniformity of the sequence of gonad (G) and pubic hair (PH) development in the male and breast (B) and pubic hair in the female allows these components to be staged (i.e., clinically quantified). Since the PH and G or B stages do not necessarily develop or progress in unison, each should be staged separately for the greatest accuracy. The standard system developed by Tanner et al. in the 1960s with minor modifications is shown in Table 223.1.

The onset and progression of these changes vary between the sexes and within the same sex. The mean age of onset and standard deviation plus the 5th and 95th percentiles for the intervals between stages are shown in Table 223.2. An appreciation of these normal variations is crucial to appropriate and cost-effective evaluation and counseling of adolescents, particularly those who present with overt or covert concerns about their secondary sexual development.

Table 223.1
Staging Criteria for Secondary Sexual Development

MALE

Genital stage	Size of testes	Scrotum	Phallus (length)
G1	≤2cc	Prepubertal	Prepubertal (4–8 cm)
G2	3–6cc	Becomes reddened, thinner, and larger	Minimal or no enlargement (4–10 cm)
G3	6–12cc	Greater thinning and enlargement	Increased length (6–14 cm)
G4	12–18cc	Color darkens and further enlargement	Increase length, circumference, and gland size (8–15 cm)
G5	>18cc	Adult	Adult (10–18 cm)

FEMALE

Breast	Breast	Areola and papilla (nipple diameter)
B1	Prepubertal	Prepubertal (1.3–4.5 mm)
B2	Budding—elevation above chest wall by mound of subareolar breast tissue	Areola widens Papilla erect
B3	Larger and more elevation	Further widening of areola (1.5–6.7 mm)
B4	Larger and more elevation (does not occur in all females)	Areola and papilla form a mound projecting from the breast contour (4.5–10.9 mm)
B5	Adult (size variable)	No mound; areola and breast in same plane (7.1–12.7 mm)

MALE AND FEMALE

Pubic hair stage	Area	Amount	Type
PH1	Male	0	
	Female	0	
PH2	Male; base of phallus and/or scrotum	+	Long (straight or curly), slightly pigmented, and downy
	Female; labia majora and/or mons veneris		
PH3	Male; spread to mons veneris	+ +	Increased curl, coarseness, and pigmentation
	Female; increased area veneris	+ +	
PH4	Male; greater area of mons veneris	+ + +	Greater curl and coarseness
	Female; almost entire mons veneris	+ + +	
PH5	Male and female; entire mons veneris and medial aspect of the thighs	+ + + +	Adult

Source: Portions of this table derived from Rohn R. Papilla (nipple) development during female puberty. J Adol Health Care 1982;2:217. Reprinted by permission of Elsevier Science Publishing Co. and the author.

Table 223.2
Mean Age of Onset and Time of Progression between Pubertal Events

Pubertal event	Age of onset (yr) (mean ± *SD*)	Stage	Interval Between Stages (yr) at Percentiles: 5th	50th	95th
		MALES			
G2	11.9 ± 1.1				
PH2	12.3 ± 0.8	G2–3	0.4	1.1	2.2
G3	13.2 ± 0.8	PH2–3	0.1	0.5	1.0
PHV	13.8 ± 1.1	G3–4	0.2	0.8	1.6
PWV	13.9 ± 0.9	PH3–4	0.3	0.4	0.5
PH3	13.9 ± 0.9	G4–5	0.4	1.0	1.9
AH	14.0 ± 1.1	PH4–5	0.2	0.7	1.5
VC	14.1 ± 0.9				
G4	14.3 ± 0.8				
PH4	14.7 ± 0.9				
FH	14.9 ± 1.1				
G5	15.1 ± 1.1				
PH5	15.3 ± 0.8				
		FEMALES			
B2	11.2 ± 1.6				
PH2	11.9 ± 1.5	B2–3	0.2	0.9	1.0
PHV	12.5 ± 1.5	PH2–3	0.2	0.6	1.3
PWV	12.4 ± 1.4	B3–4	0.1	0.9	2.2
B3	12.4 ± 1.2	PH3–4	0.2	0.5	0.9
PH3	12.7 ± 0.5	B4–5	0.1	2.0	6.8
AH	13.1 ± 0.8	PH4–5	0.6	1.3	2.4
B4	13.1 ± 0.7				
Menarche	13.3 ± 1.3				
PH4	13.4 ± 1.2				
B5	14.5 ± 1.6				
PH5	14.6 ± 1.6				

G = genital stage PH = pubic hair AH = axillary hair
VC = voice change FH = facial hair
Source: Portions of this table were modified from Lee PA. Normal ages of pubertal events among American males and females. J Adol Health Care 1980;1:26.

Menarche typically occurs during the rapid deceleration phase of linear growth, that is, 6 to 12 months after PHV, usually between PH stage 3 and 4 and B stage 4 and 5. Menstrual periods are usually irregular, as is ovulation for the first 12 to 18 months and occasionally up to 3 to 4 years. Although minimal data are available, it appears that the male's first ejaculation may occur as early as 12 years and G stage 2 with a median age of about 13 years and G stage 3.

Reproductive capability is present from the perimenarchial period, but peak fertility usually occurs after the completion of secondary sexual development. Males can impregnate a woman once ejaculation has begun, but routinely sufficient sperm in the ejaculate probably does not occur until near the completion of secondary sexual development.

Psychologic–Sexual–Social–Cognitive Development

As the adolescent grows physically, he or she must also mature psychologically, sexually, socially, and cognitively. In this complex process, there is a dynamic interrelation among all these components as well as the physical. These nonphysical components also proceed along a continuum of development during puberty. They rarely proceed in unison and complete harmony. The onset and progression varies from individual to individual, and between the sexes. Unlike physical development, they may regress as well as progress depending on environmental stresses.

In global terms, the adolescent must: (1) emancipate himself/herself from the family, (2) accept his or her adult body (body image) and ability to procreate (sexuality), (3) develop an adult identity (self-image), (4) attain the skills required to function in society and be economically independent, and (5) develop adult patterns of thinking (integrative cognitive function). All are necessary if the person is to be an effective adult and have a fulfilling life.

This process typically has its onset early in the second decade of life and is usually completed in the early adult years. Some of the critical components in this process are depicted as a dynamic continuum in which all are interactive at any given point in time (Table 223.3). Although the stages of development in this arena cannot be assigned to a specific chronologic age, it may be useful to consider the four stages of development as early, middle, late adolescence, and young adult.

Early adolescence is characterized by (1) initial efforts to establish independence from the family, (2) beginning same-sex peer relations, and (3) questioning one's identity separate from the family. Developing independence from the family usually expresses itself as a reluctance or refusal to be a compliant participant in family activities and to ascribe equal or greater importance to same-sex peer group activ-

Table 223.3
Continuum of Adolescent Psychologic, Social, Sexual, and Cognitive Development

Early adolescence		Young adult
Dependent	→	Independent
Egocentric	→	Aware of others' needs
Body oriented	→	Self-oriented
External locus of control	→	Internal locus of control
Family identity	*Peer identity* →	Individual identity
Concrete operational thought	→	Formal operational thought
Existential orientation	→	Future orientation
Pragmatism	*Idealism* →	Practical realism
Undifferentiated sexuality	→	Differentiated intimate sexuality
Health = no disease	→	Health = sense of well-being

ities. During this phase the peer group increasingly influences the adolescent's perception of acceptable behavior and dress. Typically the adolescent's behavior is egocentric (selfish) and body focused. His or her quest for personal identity usually begins by questioning "Am I normal?" This in part is the basis for the increasing concern about his or her changing body (i.e., secondary sexual development, acne, blemishes, etc.). Ambivalence and insecurity are usually observable hallmarks. The adolescent may at one moment or day shun the family and in the next seek its security, or be the best of friends with an individual in the peer group and then suddenly view him or her as an enemy. Adolescents' time orientation is predominantly existential and their thinking concrete operational (i.e., the future and abstract thought are difficult or impossible to comprehend, and logical thinking is usually limited to a single item of information). For example, the use of transverse or sagittal sections of the human body to explain menstrual and reproductive function typically cannot be effectively comprehended. For these adolescents, health is viewed simply as the absence of disease or blemishes.

Middle adolescence is the stage in which the adolescent is usually well established in the peer group and desires to be more in conformity with it. Mixed-sex activities begin to increase. The teenager usually spends increasing time away from the family and seeks more independence. This results in more overt challenges to authority, rules, and established patterns of behavior. These adolescents consider themselves to be invulnerable and at times invincible. In this milieu, experimentation with drugs, alcohol, tobacco, dress, and sexuality begin and usually reach a peak. In addition, teenagers become more aggressive in seeking increasing autonomy and demanding privacy. Their time orientation continues to be primarily existential, but their thinking begins to move toward formal operational thought. They begin "thinking about thinking" and may withdraw for hours to do so. Philosophically, they tend to be idealistic and from the standpoint of identity begin to ask "Who am I?" Their concern about body image continues. Ambivalence and rapid fluctuations in mood are common, which can be punctuated by hours to a few days of apparent depression.

Socially, during this stage of development adolescents remain primarily egocentric. Although they begin to recognize that those around them think and have feelings, they believe that all others with whom contact is made are focused on them, that is, they believe that they are being continually scrutinized by others, the so-called imaginary audience.

In relation to anticipatory health counseling, it is important for the physician to recognize that adolescent–parent conflicts as well as risk-taking behaviors usually peak (i.e., a typical time for family and school crises that may be accompanied by physical signs and symptoms). During this stage, as in early adolescence, the teenager primarily sees himself or herself as externally controlled (external locus of control) by parents, school, and peer group, but an increasing perception of personal responsibility typically begins to emerge (internal locus of control) late in middle adolescence.

Late adolescence is perhaps best characterized as the adolescent's beginning response to the question "Who am I in relation to those around me and to the future?" Personal independence from the family and formal operational thought continue to advance as the teenager begins to more realistically consider such issues as future education, vocation, and adult sexual commitment. More consideration is given to the thoughts and feelings of others, including the parents. There is less peer group activity and commitment with most late adolescents developing two or three close friends of whom one is typically of the opposite sex. By this time, teenagers are usually able to extrapolate from their experimentation during early and middle adolescence to related experiences in different settings. Their sense of invulnerability and constant scrutiny by others begins to assume more realistic proportions. An internal locus of control continues to develop as they realize their ability to provoke others to happiness, sadness, anger, or pleasure. There is less dependence on body image and a greater emphasis on self-image as they begin to perceive themselves as both internal and external persons.

This is the time when they first begin to perceive clearly that they will be physically moving away from their home and family, and assuming increasing responsibility for varying degrees of economic separation, sexual commitment, work, or additional self-motivated education or training. They begin to experience the uncertainty of the future. Consequently, it is the most common time for separation anxiety to become manifest in the form of physical signs and symptoms. For most youth, this process occurs smoothly and is usually a time when the parents, despite their own pains of separation, renew their confidence in the capabilities of their offspring.

The young adult to adult stage, for most, primarily takes place away from the family. Individual identity becomes stabilized, and intimate personal and sexual relationships are based on the ability to identify and attempt to understand the thoughts and feelings of another. The beginning of a defined role in society begins to emerge, and an increasing sense of personal responsibility and worth continues to develop. Effective and fulfilling independent function in an adult society signifies the completion of the process.

It is worth emphasizing that the progression along the continuum of psychologic, sexual, social, and cognitive development varies. The onset and rate of progression of each component differs from individual to individual and between the sexes. Each major component should be assessed by the physician caring for an adolescent, since optimal patient management may be positively or negatively affected by the adolescent's status regarding his or her de-

velopment in one or more components. For example, a teenage female may be in late adolescence regarding her quest for independence, but in early or middle adolescence regarding her cognitive and identity development. Consequently, she may engage in sexual intercourse, but may be reluctant to seek medical advice about contraception or venereal disease because she feels she is under constant scrutiny by all with whom she comes in contact, has little or no concept of the future, and believes "pregnancy can't happen to me" (invulnerability).

An Approach to the Adolescent Patient

As in all medicine, the physician's ability to establish an effective relationship with the patient is crucial. For an effective relationship to begin, the physician must like teenagers, be comfortable interacting with them, respect them as individuals, and be willing to relate to them in a nonjudgmental manner without being nondirective. The adolescent needs a health care advocate, not a surrogate parent or "buddy." In general, he or she expects the physician to use understandable adult language and not the latest teen jargon. In the author's opinion, physicians who do not like or cannot cope effectively with adolescents should not include them in their practice.

The physician must establish himself or herself as the teenager's personal physician. The beginning point is to establish the limits of confidentiality with the patient as well as his or her parent(s) or guardian either before or at the time of the initial visit, or for those previously seen as children at a defined age such as 10 years old. Statutes relating to confidentiality for teenagers vary from state to state and should be ascertained by the physician. In the author's opinion, confidentiality should be relative. One effective statement is, "Our conversations will be between you and me alone unless I consider something to be of danger to you or others. In such instances, although I will not discuss it behind your back, I will share such information with your parent(s) and I will ask you to be present. Regarding your diagnosis and any treatment required, you and I will discuss what you wish to be shared with your parent(s) and whether you, I, or both of us will talk with them about it." A clear statement in this regard provides the basis for a mutually trusting relationship between the physician and the adolescent as well as the physician and the parent(s).

An obvious corollary to confidentiality is that the patient must be seen alone during all or part of the history and physical examination. In the author's view, the patient should be seen alone for the history and nongenital parts of the physical examination unless the patient prefers to have someone else in attendance. For the genital portion of the examination, it is appropriate to allow the patient to decide whether he or she wishes a parent, friend, or chaperone to be present or to have total privacy. Finally, the physician's relationship with the adolescent should be growth promoting wherein the patient is expected to gradually assume increasing responsibility for his or her own health care needs.

The Medical History

The generic components of the adolescent medical history are the same as for the adult with specific attention to the immunization, nutrition, sexual, and social histories.

The sequencing of the interview is important. A parent who accompanies the patient should be seen alone (1) to assess his or her perception of the patient's problem and (2) to obtain data regarding the patient's birth, developmental, and past medical and family histories. Thereafter, parents should not be seen without the patient unless the patient so desires. Next, the patient is seen alone for the remaining history and physical examination. Finally, the patient and the parent(s) are seen together to discuss the plans for further evaluation or therapy when required or to review the patient's health status if no further evaluation or therapy is needed.

The history should be taken in a quiet private room. The format should be open, caring, nonjudgmental, friendly, and not appear to be a mechanistic interrogation. It is important to remember that *what* the physician says tends to be far less important to the adolescent in an initial interview than *how* it is said. An initial focus on "getting to know" the patient with questions about activities, school, interests, or hobbies may be useful in reducing the patient's anxiety, but the first component of formal information gathering should be the reason for the visit (chief complaint) and the history surrounding it (history of present illness). The adolescent assumes that the primary reason for being there is also the physician's primary concern and therefore may become suspicious and confused if the physician focuses first on an area that has no obvious relationship to the reason given for the visit.

The patient's level of cognitive development is an important consideration in history taking if optimal information is to be obtained. For example, open-ended or complex direct questions when asked of an adolescent whose thought is primarily concrete operational will often generate an "I don't know" or a "huh?" response. Consequently, in the author's experience, for most early and middle adolescents the most effective and efficient history gathering is achieved by using simple direct questions occasionally punctuated by a question requesting further elaboration of a yes response if the teenager seems to be openly talking.

Critical components of the psychosocial history are the patient's function at home, at school, and with peers. Selected useful questions to explore these areas are detailed in Table 223.4. In general, it is wise to avoid generic-type questions, such as, "Do you have a best friend or friends at school?" Such a question is almost invariably given a yes answer, thus potentially masking an underlying problem. A yes response may only mean that the teenager speaks to some peers in the hallway and that they usually speak in return; thus the information desired (Does the teenager have a peer group to run around with or a best friend to talk to?) is not provided. More revealing and pertinent questions are: "What is your best friend's name?" or "What are the names of the kids you run around with at school?"

In a patient with a background of behavior or personality problems in childhood or puberty and/or admits to being periodically depressed for days at a time, a specific question about suicide thoughts or attempts is warranted. If the adolescent admits to thoughts of suicide, then the degree to which it has been considered should be explored. For example, has it just been a passing thought, or has he or she considered how to do it? More than a rare fleeting thought of suicide may represent a serious problem in the adolescent and requires careful attention and in some cases a psychiatric referral.

Questions relating to the sexual history should be tailored to the developmental stage and sex of the adolescent.

Table 223.4
Key Features in Assessing Adolescent Psychosocial Function

Home
Does the adolescent live with one or both parents?
Are there persistent conflicts with one or more family members?
Is there a family member to whom the adolescent feels particularly close?
Is it acceptable to express his or her own opinions?
Is he or she allowed a freedom of activity appropriate to age and maturity?
Are the parents usually strict, punitive, or overly permissive?
Does the family allow him or her adequate privacy?
Does the adolescent choose his or her own friends, date, drive the car, and have spending money?
Does he or she participate in making decisions that directly affect him or her?
School
What is his or her present school performance and attendance as compared to the past?
In what subjects does he or she excel; which subjects are most difficult?
How does the adolescent relate to teachers and other authority figures?
Does the middle or late adolescent have a vocation or career in mind?
Does he or she approach school seriously and have realistic academic goals and expectations?
Do the parents share the adolescent's school and vocational expectations?
Does the patient feel he or she has a learning problem?
Peers
Does the adolescent belong to and function in a peer group?
What is his or her best friend's name?
Does the adolescent and/or peer group use tobacco, drugs, and alcohol?
Do the parents approve of his or her peer group?
Does he or she feel lonely or isolated?
Is the adolescent uncomfortable with members of the same or opposite sex?
What pressures does he or she feel from his or her peer group, boyfriend, or girlfriend?

The primary areas to assess are: dating, petting, intercourse, pregnancy prevention, condom use, satisfaction with current sexual activity, masturbation, venereal disease, and homosexual concerns or activity. An appropriate initial question for the male is: "Do you have a girlfriend?" If the answer is no, he is unlikely to be having intercourse. If the answer is yes, then an effective follow-up is: "Do you date?" "How often do you date?" "Do you date alone?" If yes, then: "Are you sexually involved with your girlfriend?" If yes, then: "Are you having intercourse?" If yes, then: "What are you doing to prevent her from getting pregnant?" "Do you use a condom?" "Are you satisfied with your relationship and sexual experience?" Similar questions can be used to assess the female patient's sexual history.

The nutrition history is often deferred or abbreviated when gathering an adolescent database. In this age group it is an important and at times a crucial component. The adolescent is nutritionally vulnerable because (1) there is a greater demand for energy (calories), quality protein, minerals, and vitamins during the rapid phase of physical growth; (2) there is almost invariably a change in eating habits and lifestyle (irregular meals, snacking, "junk" food eating, and dieting) during puberty; and (3) there may be additional nutrient demands for the adolescent who participates in sports, is pregnant, etc. Furthermore, it is important that any concern or request by the adolescent to gain or lose weight be seriously considered by the physician if inappropriate fad diets that may lead to under- or overnutrition are to be interrupted or avoided. For example, the physician should take seriously the desire of an apparently normal-weight adolescent to lose 5 kg, or the athlete who wishes to gain weight. Failure to do so may in the former result in a diet that provides inadequate nutrition or in the latter the use of anabolic steroids. Since eating disorders are increasing in frequency in today's youth, particularly females, the patient's eating habits should be carefully explored for potential signs of anorexia nervosa, bulimia, or overeating.

Some of the key features of a successful adolescent interview are summarized in Table 223.5. Finally, it can often be revealing to conclude the interview by asking, "Are there any areas of concern you have that we have not discussed?"

The Physical Examination

The physical examination often provokes significant anxiety in adolescents. Consequently, it is important to properly prepare the teenager for the examination and to communicate to the patient your findings and an interpretation. The former can be accomplished by reviewing with the adolescent what is to be done during the physical examination immediately following the interview while he or she is still dressed. For example, the physician can state to the male patient, "Next I (use the first person, not the third since the adolescent may be confused and apprehensive about what "we" means) will need to do a physical examination. I am going to examine the area that has been a problem for you as well as your eyes, ears, nose, throat, neck, chest, breasts, stomach, arms, legs, penis, and testicles. Once you are in the examination room, the nurse will tell you how to put on the examination gown after you have removed all your clothes. Before anyone comes back into the room, a knock will be used to assure that you are ready. Do you have any questions?"

For the adolescent, privacy and autonomy are important issues. Both females and males are basically modest. Consequently, it is important to provide an examination gown

Table 223.5
Critical Features of a Successful Adolescent Interview and Physical Examination

Interview
State the basis of *confidentiality*
See the patient *alone*
Be *open, flexible, relaxed,* and *unhurried* in your approach
Talk to the patient on *his or her level*
Answer questions *honestly* and *simply*
Trust the patient and *respect* his or her right to a point of view
Physical examination
Give an *overview* of the examination prior to the patient's disrobing
Respect the patient's *privacy* and *modesty*
Focus your examination on the area identified as the reason for the visit (chief complaint) *but*
Pay attention to *blemishes, deformity,* and *stage of secondary sexual development*
Inform the patient as to what is normal or abnormal

that covers the trunk and genital area. During the examination the adolescent's feeling of control can be simply and effectively enhanced by having him or her uncover the area which needs to be exposed for examination. Talking with the adolescent during the examination also tends to increase comfort; however, the conversation should be appropriate to the area being examined (i.e., don't discuss the weather while examining the breasts or genitals; discuss the area being examined). The key features for the adolescent physical examination are summarized in Table 223.5 and the stage of development when selected problems are most likely to occur in Table 223.6.

In the physical examination, as in the interview, the first component examined should be the area suggested by the reason for the visit, even though it may differ from the physician's usual sequence for a complete physical examination.

Since the adolescent is concerned about body growth, development, and "normality," it is important to identify acne, blemishes, or deformities and inquire as to the adolescent's concern about them. If an area appears to be normal and secondary sexual development appropriate for age, it is important to so inform the adolescent since he or she may not ask de novo. This simple process often relieves tension, allays fear, and opens the way for the adolescent to ask questions that would otherwise not be verbalized.

Key components of the adolescent's physical examination include an accurate height (without shoes) and weight (preferably in the examination gown); sitting or supine blood pressure; staging of the genitals in the male, breasts in the female, and pubic hair in both; breasts in the male for possible gynecomastia; back for scoliosis (particularly females) and dorsal kyphosis; skin for acne, hyperkeratosis, hyperhidrosis, and in females hirsutism; teeth for obvious dental pathology; visual activity; and hearing.

The patient's height and weight should be recorded on a longitudinal (NCHS) or velocity (Tanner and Whitehouse) growth chart along with all available prior values. This (1) provides an effective method of assessing the patient's growth rate per year and (2) establishes his or her usual growth percentile. Height and weight normally progressives continuously during childhood and puberty until the deceleration nadir after the PHV or PWV year. A distinct plateauing of linear growth or weight gain or an unexplained weight loss (>2 kg) should alert the physician to possible underlying disease and a need for close observation and/or further evaluation. The adolescent's stage of secondary sexual development should also be carefully recorded for testes or breasts, and for pubic hair. A distinctly early or delayed onset and/or rapid or slow progression may be the result of hypothalamic, pituitary or gonad disease, abnormal genetic composition (Turner or Kleinfelter syndrome, etc.), or an underlying, often occult, organic disease such as hypothyroidism, inflammatory bowel disease (primarily Crohn's), renal tubular acidosis, etc. Although there are no absolute criteria for recognizing abnormal height and weight gain and secondary sexual development during puberty, the guidelines shown in Table 223.7 have proven to be clinically useful.

A rectal examination in males is required only when there is a suspicion of prostate or bowel disease, unexplained anemia, or homosexual activity. In the latter instance, a rectal culture for gonorrhea should be obtained. A female pelvic examination is required when there is a suspicion of disease, abnormal secondary sexual development, pregnancy, the patient's mother received DES during her pregnancy, contraception is requested, or the patient is

Table 223.6
Selected Correlations with Sexual Maturation Ratings in Males and Females

	Male: gonad stage (G)	Female: breast stage (B)
Pubertal event		
Peak height velocity (PHV)	3–4	2–3
Peak weight velocity (PWV)	3–4	2–3
Axillary hair	3–4	2–3
Rapid penis growth	3–4	—
Voice break and change	3–4	—
Nocturnal emissions	3–4	—
Menarche (1–3.6 yr post B2)	—	3–4
Regular ovulatory menses	—	4–5
Rapid increase in muscle strength	4–5	—
Facial hair	4–5	—
Medical concerns		
Acne (onset)	2–3	2–3
Adolescent gynecomastia	2–3	—
Slipped capital femoral epiphysis (obese)	2–3	2–3
Osgood-Slatter disease	2–4	2–3
Rapid increase in idiopathic scoliosis	3–4	2–3
Rapid increase in dorsal kyphosis	3–4	2–3
Gonococcal cervicitis	—	2–5
Laboratory parameters (peak levels)		
Insulin-like growth factor I (SMC)	3–4	2–3
Alkaline phosphatase	3–4	2–3
Uric acid	4	—
DHEA	4	4
DHEA-S	4	4
Testosterone	5	5
Estradiol	5	5
Hemoglobin and hematocrit	5	5

Table 223.7
Guidelines for Identifying Abnormal Growth in Height, Weight, and Secondary Sexual Development in Adolescents

Height
A linear growth rate <4.5 cm/year or >9.0 cm/year prior to PHV year
PHV year before age 11.6 years (male) and 9.5 years (female)
No PHV year by age 16 years (male) and 15.5 years (female)
Distinct plateau or deceleration in yearly linear growth velocity below the individual's established rate

Weight
Distinct acceleration in weight gain (>7 kg/year) or deceleration (<1 kg/year) prior to PWV year
An unexplained loss of ≥2 kg

Secondary sexual development
Onset prior to age 8.0 years (female) or 9.7 years (males)
Menarche prior to 10.7 years or lack thereof by 15.9 years
PH stage 3–4 and B1 or G1
Progression between stages slower than 95th percentile[a]

[a]See Table 223.2

Source: Portions of this table are modified from Daniel WA Jr. Growth in adolescence: clinical correlates. Semin Adol Med 1985;1:15. Reprinted by permission of the author and publisher.

sexually active. If an examination is performed, a baseline pap smear and culture for gonorrhea should be obtained.

Laboratory Evaluation

Baseline laboratory data for the adolescent should include: hemoglobin or hematocrit, urinalysis, cholesterol, hemoglobin electrophoresis in blacks, as well as a rubella titer in females. Since hemoglobin/hematocrit values increase progressively in males during secondary sexual development and minimally so in females, it is important to interpret the values according to their stage of development. For example, a hematocrit of 36% is normal for a male or female in stage 1 (prepubertal) compared to 41% in the stage 5 male and 37% in the female. Adolescents who use drugs or alcohol should also have baseline liver function tests. Since alkaline phosphatase (AP) rises above normal adult values during puberty, it too must be interpreted in conjunction with the stage of development. AP levels begin to rise with the onset of puberty, peak at the time of PHV in both males and females, and usually decline into the normal range by the time an adolescent has reached stage 5. Peak values may be as high as three times the upper normal adult values.

Preventive Health Care

The best therapy for disease is prevention or early treatment. Consequently, anticipatory health care counseling and early detection should be routine when providing comprehensive health care for the adolescent. Table 223.6 identifies some of the critical areas for attention based on the adolescent's stage of development.

Some important issues for anticipatory health care counseling are: G2-3 or B2 a significant, usually rapid, growth in height and weight should begin within a few months during which time a degree of temporary physical disequilibrium will occur; G4-5 a major increase in strength will occur and such activities as weight lifting should be deferred until that time; G3-4 nocturnal emissions and masturbation are common and are not physically harmful; B2-3 menarche and menses should be reviewed; G3 or B3 discussions of sexuality, venereal disease, and prevention of pregnancy should be offered; and at the appropriate stages the major symptoms and/or signs of potential medical concerns can be brought to the adolescent's attention. In addition, most adolescents are appreciative of a brief overview of what to expect during their next stage of growth. For such counseling to be most effective, it must be tailored to the individual's level of psychologic, sexual, social, and cognitive development.

Conclusion

In summary, puberty is a complex dynamic process about which the physician must have a general working knowledge if optimum comprehensive care is to be provided. As a patient, the adolescent can be frustrating, maddening, unpredictable, time-consuming, and frightening. More important, and more often, caring for him or her is challenging and rewarding.

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